

CIRCUIT DESCRIPTION

CD-3C252-01
ISSUE 3A
APPENDIX 5D
DWG ISSUE 8D
DISTN CODE 1N14

17

COMMON SYSTEMS
T1C OFFICE REPEATER BAY
APPLICATION SCHEMATIC

CHANGES

D. Description of Changes

D.1 In FS 12, leads T2, R2 and T4 are shown reversed. They are changed to agree with the equipment.

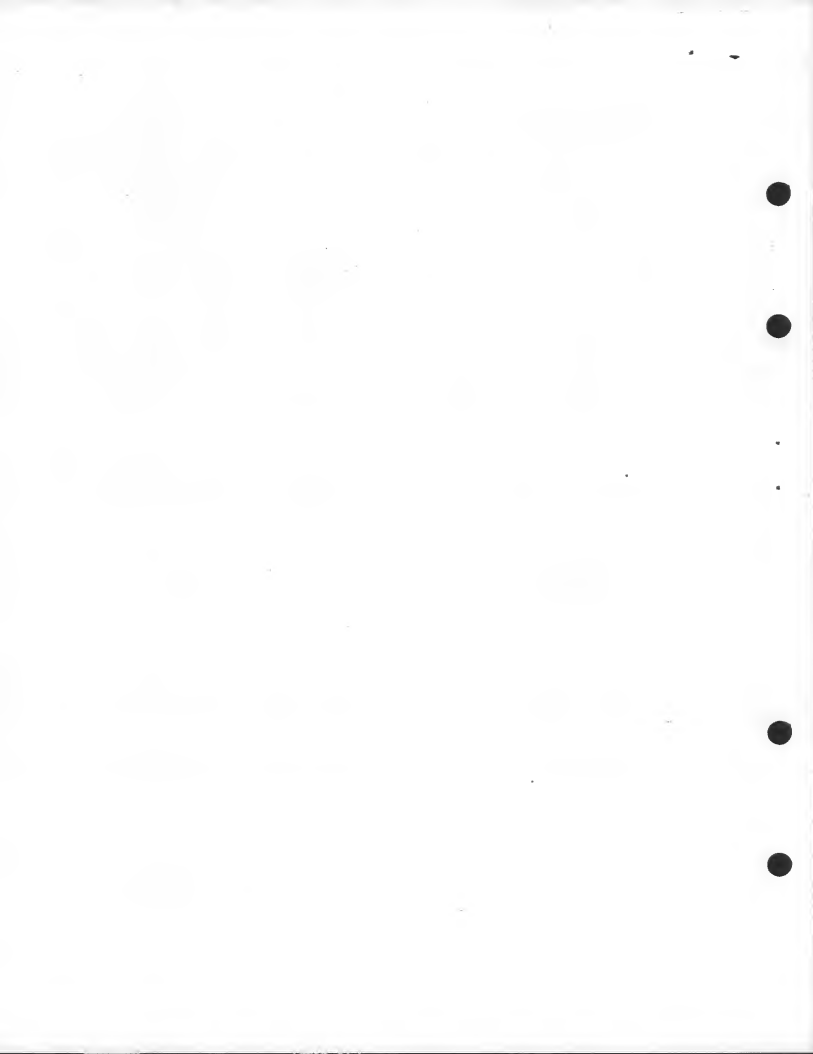
D.2 Information Notes on sheets D4 and D5 are revised to clarify the power loop information.

D.3 Power notes on sheet D3 are revised completely to clarify the information for T1C standard and low power applications.

D.4 In CAD5, Note 1, 750-Type and 22-BF Type cable is added for the bridging position.

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DEPT 4223-WJ-JBS



CIRCUIT DESCRIPTION

CD-3C252-01
ISSUE 3A
APPENDIX 4B
DWG ISSUE 7B
DISTN CODE 1N14

16

COMMON SYSTEMS
T1C OFFICE REPEATER BAY
APPLICATION SCHEMATIC

CHANGES

D. Description of Changes

D.01 In FS 1 and FS 2, leads connecting to terminals 42,43 are changed to T,R while connection to pins 24,25 are changed to T1,R1. Also, reference to Equipment Note 217 is added.

D.02 In FS 3 information, Table C and notes 5 and 6 are added, covering the use of the ED-3C655-30 (6-volt equalizers).

D.03 FS 14, covering the T1C/T1 QRSS, has been changed to show new information when it is equipped in the repeater bay.

D.04 In FS 15 and FS 17, connecting information is updated for the QRSS.

D.05 In FS 16, the monitor resistors (R19 and R20) are changed from 1000 ohms to 430 ohms.

D.06 In Information Note 302, the reference to ONE CABLE has been deleted.

D.07 In FS 15, FS 16, and FS 17, where 3.152 M/B appears, it is replaced by T1C/T1.

D.08 In CAD Fig. 1 through CAD Fig. 4, where reference is made to 25-PAIR ABAM CABLE, type 609B (25 pair) or type 610B (50 pair) cable may be run from the main frame to the bay.

D.09 In CAD 5, where reference is made to 6-PAIR ABAM CABLE, type 606B cable (6 pair) may be run.

D.10 In CAD 7, connecting information to the D4 bank and DCT frame is added.

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D.11 In CAD 16, connecting information to the fault locate Jacks is added.

D.12 CAD 17 and CAD 18 have been added to the schematic covering connections to the QRSS.

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DEPT 4223-WAJ-JBS

CIRCUIT DESCRIPTION

CD-3C252-01
ISSUE 3A
APPENDIX 3B
DWG ISSUE 6B
DISTN CODE 1N14

14

COMMON SYSTEMS
T1C OFFICE REPEATER BAY
APPLICATION SCHEMATIC

CHANGES

D. Description of Changes

D.01 In FS 1 and FS 2 connections to FS 3 (via 2B1) are changed to T1,R1 leads. They were previously T,R leads.

D.02 In FS 3 lead designations are changed from T1,R1 to T,R.

D.03 In FS 4, leads T1A,R1A through T1D,R1D are changed to TA,RA through TD,RD on. The bridge side of the JTS white leads T1A,R1A through R1A,R1D replace TA,RA through RA,RD at the BRDG repeater side of the JTS.

D.04 In FS 5, T1,R1 leads at the bridging input jack are changed to T,R leads.

D.05 Sheet Note 4 is added to FS 5 explaining the use of the fault locate jacks.

D.06 In FS 7, connections to remote office alarm circuits are added.

D.07 In FS 7, sheet note 2 is changed to cover the T1 application.

D.08 In FS 8, option 8 has been added. 231 repeaters, operating at 60 mA.

D.09 In CAD 5, lead designations for the bridging repeater are changed to TA,RA through TD,RD.

D.10 CAD 16 is added covering fault locate connections to the HMDF.

D.11 In CAD 10, reference is made to CAD 16 and to the DSX.

D.12 Equipment Notes 221 and 222 have been added covering the dressing and connection of ABAM cables to the bay and main frame.

D.13 Power option CEK on the office repeater has been added to the power note section of the schematic.

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DEPT 4223-WAJ-JBS

CIRCUIT DESCRIPTION

CD-3C252-01
ISSUE 3A
APPENDIX 2A
DWG ISSUE 5A

COMMON SYSTEMS
TIC OFFICE REPEATER DAY
APPLICATION SCHEMATIC

CHANGES

D. Description of Changes

D.01 In FS 4, T, R and T1, R1 designations were changed at the JTS in order to be compatible with the DSX-1C.

D.02 In FS 5, the jacks were designated to be consistent with the JTS labeling of T, R and T1, R1 leads.

D.03 In FS 5, the ABAM cable shield at the fault locate jack circuit was connected to frame ground.

D.04 In FS 7, frame ground connections were removed from the EU wires connecting to TSC for connections to FS 5 fault locate jack circuit. Also, Note G was added to cover spare fuse positions.

D.05 In FS 8, W option was previously shown incorrectly at position 13 for J303, J307.

D.06 In APP Fig. 8, resistors R14 and R15 were changed to KS-14603, List 3AD. They were previously specified as KS-14603, List 3A.

D.07 Information Notes 305 and 306 covering connections to DSX-1C were updated to agree with the DSX-1C.

D.08 In CADs 3 and 4, incoming and outgoing lines are now shown connected to protector blocks at the MDF.

D.09 CAD 5, covering connections to the DSX-1C was changed to include the proper T, R and T1, R1 designations, and Sheet Note 2 was added.

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D.10 CADs 13, 14, and 15 were added covering order wire connections to other order wire locations to central office equipment and to the DSX-1C.

D.11 Equipment Note 202 was revised.

D.12 In FS1-FS3, T-R and T1-R1, designations were changed in order to be in agreement with other digital systems.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 4223-WAJ-JBS

CIRCUIT DESCRIPTION

CD-3C252-01
ISSUE 3A
APPENDIX 1B
DWG ISSUE 4B

12

COMMON SYSTEMS
T1C OFFICE REPEATER BAY
APPLICATION SCHEMATIC

CHANGES

D. Description of Changes

D.1 In FS 7, fault locate connections to the DSX-1C were added to terminal strip TSC for connectors J12 and J16.

D.2 In FS 7, fault locate connections to the DSX-1 were added to terminal strip TSC for connectors J11 and J15 for the T1 application.

D.3 In FS 12, Sheet Note 3 was added for the order wire circuit regarding offices which cannot accept loop closures for service alarms circuits.

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DEPT 4323-WAJ-JBS

COMMON SYSTEMS
TIC OFFICE REPEATER BAY
APPLICATION SCHEMATIC

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<u>E. ALARMS</u>	2	cuitry, equipment, and connecting circuits	
<u>F. POWER DISSIPATION UNIT</u>	2	that are required in the central office for	
<u>G. FUSE, ALARM, AND FAULT LOCATE</u>		use with the TIC digital line. Detailed	
<u>FILTER PANEL</u>	2	information is provided for a shop-wired	
<u>H. ORDER WIRE AND TEL-SET CIRCUIT</u>	3	office repeater bay (ORB) including such	
<u>I. JACK AND CROSS-CONNECT PANEL</u>	3	hardware as shop-wired connectors and	
<u>J. EQUALIZER CONNECTORS</u>	3	associated equipment that will accommodate	
<u>K. JACK FIELD INTERFACE TERMINAL STRIP</u>		up to 104 220-type plug-in office repeaters	
<u>(JTSI)</u>	3	in an 11-foot 6-inch bay arrangement. Of	
<u>L. -48 VOLT POWER DISTRIBUTION CIRCUIT</u>		these, 96 are associated with working	
<u>lines</u>	3	lines, 4 are associated with spare lines,	
<u>M. OHM/VOLT CIRCUIT</u>	3	and 4 are bridging repeaters. In addition	
<u>N. -48 VOLT TEST SET POWER</u>	3	to the 11-foot 6-inch ORB, both 7- and	
<u>SECTION II - DETAILED DESCRIPTION</u>	3	9-foot bays are provided with similar	
<u>1. TRANSMISSION</u>	3	hardware, but accommodate half the capacity	
<u>2. POWER</u>	5	of the larger ORB. Each repeater equipped	
<u>3. FAULT LOCATING</u>	5	connector forms the span termination for a	
<u>4. INTRAOFFICE CABLING</u>	5	TIC digital line. Some of the other cir-	
<u>5. INTERBAY CABLING</u>	6	cuits specified in this information include	
<u>6. SYSTEM DIAGRAMS</u>	6	hard-wired connectors for plug-in equal-	
<u>7. CABLING DIAGRAMS</u>	6	izers, jack and cross-connect panel, fault	
<u>SECTION III - REFERENCE DATA</u>	7	location, fuse and alarm provisions, power	
<u>1. WORKING LIMITS</u>	7	dissipation circuits, order-wire and tel-	
<u>2. FUNCTIONAL DESIGNATIONS</u>	7	set circuits, and span-line powering	
		arrangements.	
		<u>1.02</u> The ORB will accept plug-in repeaters	
		designated 220-type. There are three letter	
		codes of repeaters provided; the 220A which	
		includes a line current regulator for	
		powering lines as well as transmit and	
		receive circuitry, the 220B which provides	
		for looping power (no regulator circuitry),	
		and the bridging repeater which is coded	
		220C.	
		<u>1.03</u> The 220A and 220B repeaters consist	
		of circuits carrying two separate direc-	
		tions of transmission (transmit and	
		receive), both associated with the same	
		system. As previously noted, the 220A and	
		220B types are identical except that the	
		regulator circuitry is not provided in the	
		220B. The circuitry associated with the	

transmitting direction (or outgoing) is passive. It provides an artificial line circuit, secondary lightning protection, and a means for simplex line current to the repeated line. The receive circuitry (or incoming) is active. It provides pulse equalization, timing recovery, and pulse regeneration as well as secondary lightning protection and a means for fault location. A detailed description of the 220-type office repeater is given in CD-3C253-01.

1.04 The T1C system is a baseband digital transmission system that utilizes two exchange grade cable pairs for bidirectional transmission of 48 PCM encoded voice or data channels. Note that this is double the capacity of the existing D/T1 system. A multiplexer, the MIC, provides an interface between DS-1 signals at 1.544 Mb/S and the T1C signal at 3.152 Mb/S. The T1C digital line provides the facilities for transmitting and receiving the bipolar pulses of the MIC. In a central office, the ORB provides a means for making cross-connections between repeaters in an intermediate office, or between repeaters and the MIC multiplexer in a terminal office, or both since a bay can serve as a terminal and intermediate point.

1.05 The T1C digital line signal is in the form of binary-coded pulse trains including Muldem synchronizing pulses. These pulses are bipolar; that is, alternate positive and negative, and occur at a rate of 3,152,000 per second.

1.06 The T1C ORB is used in conjunction with the MIC as a terminal at each end of a digital line where T1C spans may terminate at the central office in the office repeaters that are mounted in the ORB.

2. GENERAL DESCRIPTION OF OPERATION

A. GENERAL

2.01 The function of the T1C digital system is to provide multiplexing and transmission facilities for 48 PCM encoded voice channels. Two T1 type signals are time-divided multiplexed by the MIC multiplexer; thus, forming the T1C signal at 3.152 Mb/S. The signals are then transmitted over a 4-wire T1C digital line.

B. SIGNAL TRANSMISSION

2.02 The office repeater bay equipment, in conjunction with the line equipment, provides facilities for transmitting and receiving the 3.152 Mb/S signals of the MIC multiplexer. Cross-connections between MICs and ORBs or between ORBs in an intermediate office is provided. Detailed information and cabling to the outside plant is covered in the detailed description of this document.

C. POWER

2.03 The 218- and 219-type line repeaters designed for use in the T1C digital line are powered from the central office. The 220-type office repeaters that are housed in the office repeater bay contain constant-current regulators which supply nominal simplex current (120 $\pm$ 4 mA) to the line repeaters. The 220-type repeaters can be powered locally or in series with the line repeaters.

D. FAULT LOCATION

2.04 The 220A and 220B office repeaters are equipped with circuitry that is required to troubleshoot out-of-service lines. Fault locate cable pairs are provided to the office repeater bay, and by using the fault locating plan, a defective repeater can be identified from the central office.

E. ALARMS

2.05 Alarm arrangements are provided for connections to the central office audible and visual alarms. Connections to the E2 remote alarms can be provided on an optional basis.

F. POWER DISSIPATION UNIT

2.06 The high dissipation resistors that are associated with the line current regulator circuit in the office repeaters are grouped into the power dissipation units located at the top of the ORB. Each plug-in unit is dedicated to a particular shelf of repeaters. Thus in a 7- or 9-foot bay there will be four power dissipation plug-ins, while in the 11-foot 6-inch bay, eight plug-ins are required. Note that the power dissipation resistors serve the purpose of preventing overload of the regulator transistor during high dissipation conditions.

G. FUSE, ALARM, AND FAULT LOCATE FILTER PANEL

2.07 The fuse and alarm panel is used to distribute -48, -130, and +130 volt battery power to the office repeater shelves as required per FS 7. Note that the power delivered to each shelf is separately fused. Alarm relays are provided to indicate fuse failure. In the case of a shelf fuse failure, a pair of relay contacts are operated so that the red (major) lamp is illuminated. In the event of a repeater unit fuse failure, another pair of relay contacts are operated so that the white (minor) lamp is illuminated. Eight separate fuse positions are provided for such equipment as the order wire circuit, test set power, and miscellaneous equipment that require -48 volt battery. In addition, four connectors are provided

in the fuse and alarm panel that accept the 1068-type plug-in fault locate filters. Also, a short circuit is provided by the use of microswitches S1 through S4 when no fault locate filter is required.

H. ORDER WIRE AND TEL-SET CIRCUIT

2.08 This circuit is associated with a TIC carrier route. It is designed to furnish voice facilities between repeater locations and terminal offices which will be used in the normal routine maintenance of the TIC system. Refer to CD-3C254-01 for a detailed description of the order wire circuit.

I. JACK AND CROSS-CONNECT PANEL

2.09 The patching and cross-connections functions are combined in a single shelf assembly that is mounted in the office repeater bay. The jack field provides the jack appearances for all of the office repeaters, for the fault locate circuit, for the -48 volt test set power, and all other miscellaneous jacks except those for the order-wire panel which is self-contained. In the 11-foot 6-inch ORB, the jack panel contains the jacks for eight shelves of office repeaters plus miscellaneous jacks. In the 7- or 9-foot ORB arrangement, jacks are provided for four shelves of office repeaters plus miscellaneous jacks. The jacks for each 220-type office repeater provide a normalled-through connection at the regenerator output (ROUT, XIN), a similar connection at the transmitting side input (XOUT, LIN) and bridging jack arrangements. Cross-connections within a bay are made via the SPAN CROSS-CONNECT field. Cross-connections to noncontiguous bays and the WIC bays are made via the BAY CROSS-CONNECT field.

J. EQUALIZER CONNECTORS

2.10 Associated with each repeater connector position is a connector assembly provided for plug-in type equalizers that are required for consistent intraoffice transmission.

K. JACK FIELD INTERFACE TERMINAL STRIP (JTS)

2.11 A terminal strip is provided between the office repeaters on one side and the jack and cross-connect panel on the other side. The terminal strip is divided into two sections; one for outgoing signals from the equalizer connector to the jack field, and the other section for incoming signals from the jack field to the passive side of a repeater. In addition, connections to the DSX-1C are provided for at the terminal strip. Also, on an optional basis, connections are provided for the T carrier administration system.

L. -48 VOLT POWER DISTRIBUTION CIRCUIT

2.12 -48 volt power is distributed from the fuse and alarm panel to the repeater shelves via the -48 volt power distribution circuit. Each repeater position has a 422-ohm series dropping resistor associated with it that provides the -RPT power to the repeater when the repeater is powered separately.

M. OHM/VOLT CIRCUIT

2.13 +130 volt power is distributed to the repeater shelves from the fuse and alarm panel via the ohm/volt circuit. Each repeater connector position has a 110-ohm resistor that is in series with the plus (+) lead that, in conjunction with the regulator, provides current limiting.

N. -48 VOLT TEST SET POWER

2.14 In order to provide test set power to those test sets designed to operate from -48 volts via a 310-type jack, three jacks are provided for this purpose on the miscellaneous jack panel. Negative 48 volts is connected from the fuse and alarm panel to the tip of Jack J1. Ground is connected to the sleeve. Jacks J2 and J3 are then multiplied to J1. A separate fuse for the test set jacks is provided in the fuse and alarm panel.

SECTION II - DETAILED DESCRIPTION

1. TRANSMISSION

1.01 The TIC office repeater bay is a shop-wired 23-inch duct-type bay. Three designs are available; the 7-foot, 9-foot, and 11-foot 6-inch arrangements. When fully equipped, the 7-foot or 9-foot ORB contains 48 working repeaters, 2 spare-line repeaters, and 2 bridging repeaters. The 11-foot 6-inch bay arrangement contains 96 working repeaters, 4 spare-line repeaters, and 4 bridging repeaters. Interconnection wiring is provided at the time of installation.

1.02 A fully equipped 7- or 9-foot ORB contains four repeater shelves; whereas a fully loaded 11-foot 6-inch ORB contains eight repeater shelves. The repeater shelves are front mounted and 8 inches in height while providing slots (or positions) for accepting thirteen 220-type office repeaters. The shelf design includes a baffle type arrangement that enhances air flow from the front of the bay to the back side of the bay. This has the effect of reducing the bay temperature. The baffle occupies 2 inches of the overall shelf height.

1.03 Shown in FS 1 is the interconnect wiring for thirteen office repeater positions

for all the odd-numbered shelves. Similar information is shown in FS 2 for even-numbered shelves. Incoming line signals are connected to terminals 26 and 27 on the connectors. Incoming signals arrive at the ORB via the MDF (located in the central office) and the distributing terminal strip (DTS) located at the top of the ORB. The tip cable from the cable vault connects to the office ABAM cable at the MDF. Regenerated output signals appear on connector terminals 49 and 50. Connections are then made from these terminals to the equalizer connector circuit shown on FS 3. There is an equalizer connector associated with each repeater connector position. Signal flow in the transmit direction is from the jack field interface terminal strip (FS 4) to the repeater connectors terminals 42 and 43. Outgoing signals (transmit) are then wired to the DTS from repeater connector terminals 34 and 35. Again, the MDF provides for the connections required from the ORB to the outside line. Also depicted in FS 1 and FS 2 are connections required for powering the office repeaters and connections for fault location purposes. These will be covered later. Note that in FS 2 all repeater connector positions labeled 26 are dedicated to the bridging repeater. Positions labeled 25 are dedicated as the main spare line.

1.04 FS 3 shows the interconnect wiring for the equalizer connector that accesses the plug-in type equalizer coded EP-3C955-30. There is an equalizer connector position provided for each repeater connector position. Pins 1 and 2 of the equalizer connector are the input terminals that connect to terminals 49 and 50 of the repeater connectors. The output pins 3 and 4 are wired to its corresponding repeater connector position on terminals 24 and 25 (used as a tie point for wiring to FS 4). The equalizer connector will accept any of the three different coded plug-in equalizers that provide for pulse equalization for up to 400 feet of intraoffice ABAM cabling. Refer to FS 3, Table B, for the different equalizer codes.

1.05 FS 4 shows the jack field interface terminal strip which essentially serves as a hub for all connections to the jack and cross-connect panel on one side and the equalizer connector or the repeater connector (transmit direction) on the other side. A regenerated signal appearing at the output of an equalizer is wired to the JTS (FS 4) for outgoing signals. Up to 104 regenerated signals make an appearance at the JTS. For example, a regenerated output signal at repeater connector position 1 is connected to its associated equalizer connector position. Then, this signal is connected to pins 1 and 2 on the JTS where now the signal may be connected to the jack and cross-connect panel or to the DSX-1C, if desired. Note that four pairs are

dedicated to the bridging jacks shown in FS 5. The other part of the JTS provides tie points for the signals that are connected to the office repeater transmit direction. These signals are connected to the JTS from the jack and cross-connect panel or from a DSX-1C. As is the case for regenerative-type signals connected to the JTS (outgoing), pins 1 and 2 are connected to its corresponding repeater connector position, No. 1, terminals 42 and 43. Connections to the bridging repeater are also shown on FS 4.

1.06 The regenerated signals are connected from FS 4 (JTS) to the jack and cross-connect panel to the jacks that are designated ROUT in FS 5. The signal flow is through the normalled-through jacks connected to the span cross-connect. In-service signal monitoring jacks are provided for every regenerated signal appearing at the jack field. The (LIN) jacks provide access to the cross-connect side of the bay. Signals in the transmit direction are connected from the span cross-connect to the jack field designated for incoming signals. The signal is normalled-through the jack field and connected to FS 4. The (LIN) jacks provide access to the outside line. The (XOUT) jacks provide access to signals cross-connected in the transmit direction. In-service signal monitoring jacks are also provided for the transmit direction. In addition, FS 5 covers the connections provided for the bridging jacks. Note that jack field position 26 is always dedicated to the inputs and outputs of the bridging repeater. A signal from a working line may be placed on a spare line by use of the bridging repeater and associated jack. Interruptions in service can be minimized by using the bridging arrangement when patching systems. The circuit also provides a way to put a signal source on a spare line or idle line. The input of the bridging repeater is accessible at the (BIN) jack shown in FS 5. The output of the bridging repeater appears at the (BRDG OUT) jacks in FS 5. By making a patch from a (MON) jack of a working system to the (BIN) jack, a signal attenuated by approximately 26 dB is applied to the bridging repeater input. Once regenerated, this signal can be patched onto any other line by patching from the (BRDG OUT) jack of the bridging position to the desired line. Note that the bridging repeater output (FS 2) connects to its corresponding equalizer connector (FS 3) before appearing at the jack field. Monitor jacks are also provided for the bridging signals.

1.07 FS 6 covers the connections to the span cross-connect strip. This terminal strip is provided in the ORB for cross-connecting intraoffice transmission pairs that appear on the office side of the 220-type repeaters to other systems in the same ORB or in contiguous repeater bays. Up

to 100 working circuits make appearances at the span cross-connect strip in the 11-foot 6-inch ORB. The 7- and 9-foot ORBs handle a maximum of 50 circuits. A bay cross-connect strip is also provided in the ORB for cabling intraoffice transmission pairs from the span cross-connect strip in an ORB to noncontiguous repeater bays, or to the MIC multiplexer bay.

2. POWER

2.01 The fuse and alarm circuit per FS 7 provides the -48 volt, +130 volt, -130 volt, ground, and alarm connections required for the ORB. Each office repeater bay is provided with two separate power feeders for each office battery voltage used. These power feeders are referred to as the A feeder and B feeder in FS 7. A maximum of three bays may be powered from a common feeder. The shelves are powered from the fuse and alarm panel such that all odd-numbered shelves are connected to feeder A while all even-numbered shelves are connected to feeder B. This arrangement minimizes the number of circuits lost when a fuse failure occurs. The ORB is powered from the battery distribution fuse board or battery control board or from the power equalizing center in the central office. Fusing and current drain information is covered under Circuit Note 101 for the central office battery. Each battery voltage applied from the fuse and alarm panel to the repeater bay shelves is separately fused in the fuse and alarm panel. Resistors R6, R7, and R8 provide current limiting between the two power feeders in the event of simultaneous failures of fuses on an odd and even shelf. In addition, -48 volt miscellaneous voltage is provided for powering such equipment as the order wire, tel-set, test jacks, and signal sources. These equipments are separately fused at the fuse and alarm panel. Also, four spare fuse positions are provided for future use. Two lamp indicators are provided as part of the fuse and alarm panel. Lamp FA2, when illuminated, indicates a fuse failure for the equipment that is powered from the -48 volt miscellaneous voltage (order wire and tel-set, test jacks, signal sources, etc. etc.). Lamp FA2 (white), when illuminated, indicates a repeater fuse failure, while Lamp FA1 (red) indicates a repeater shelf failure when illuminated. Alarm relays K1 and K2 are provided to permit connections to the central office alarm circuits for audible and visual indications of a fuse failure in the office repeater bay equipment. The 186A networks (Z1 through Z4) that are connected to the alarm relays are provided to minimize any transients due to the alarm relays being energized. Resistors R14, R15, and R23 are series-dropping resistors associated with the lamp circuits. (Note that the lamps operate on 24-volt battery,

drawing a maximum current of 40 mA.) Four connectors, J11, J12, J15, and J16, provided as part of the fuse and alarm panel, are designed to accept the 1068-type plug-in fault locate filter. Shelves 1 through 4 connect to J12, while shelves 5 through 8 connect to J16. Switches S1, S2, S3, and S4 provide a short circuit for the fault locate pairs when no filter is plugged into the slot.

2.02 The office repeaters used in the central office supply power to the line repeaters in the apparatus cases. Since the power requirements are dependent on the length of the span, this information is carefully calculated for each office. This information is provided in the power notes section of the application schematic. Note that a power loop is efficiently designed when the calculated value of RS as defined in the power notes is within 150-ohms of the maximum value permitted for a particular span line voltage. By using 220B looping repeaters and selecting series or separate powering of office repeaters as needed and correctly choosing 215 or 219 line-looping repeaters where appropriate, power dissipation within an office repeater bay can be minimized.

2.03 Office repeater powering options are given in the power notes. These options are also covered in the office repeater drawing (SD-3C253-01).

2.04 Information figures 301 through 303 are provided to illustrate some different powering arrangements.

3. FAULT LOCATING

3.01 At central offices where fault-locating lines terminate, a fault locate line jack circuit per FS 5 is provided for both east and west fault locate lines. Two 1000-ohm resistors per U option are provided as terminations for these lines. At intermediate offices, the termination resistors are removed and V option is provided so the fault locate lines can be through-connected. When it is required to fault locate an office repeater, it is then necessary to equip J12 and J16 in the fuse and alarm panel (FS 7) with a 1068-type plug-in fault locate filter. Note that, when this fault locate filter is not used, switches S2 and S4 in FS 7 provide a short circuit for the fault locate outputs of FS 1 and FS 2.

4. INTRAOFFICE CABLING

4.01 Shown in CD Fig. 1 is a typical TIC intraoffice cabling arrangement. The office repeater bays are connected back-to-back using a centralized patch and cross-connect bay.

4.02 The length limitation for an office end section is 4000 feet due to office switching noise. This length is measured from the last line repeater to the office repeater bay. Tip cable from the cable vault to the MDF or IDF is dedicated to carrier systems with high-level and low-level signals assigned to separate sheaths. Connections to the office repeater bay is made with ABAM cable runs which terminate in protectors on the vertical side of the MDF.

4.03 The TIC cross-connection arrangement provides for dedication of span lines in groups of 50 systems. A group of 50 systems (including two spares) would include:

- (a) Four shelves of an office repeater bay for terminating 50 incoming span lines and 50 outgoing span lines at each end of the span.
- (b) Four 25-pair ABAM cables between the office repeater bay and the MDF, one for each direction at each end of a span.
- (c) Two 50-pair tip cables (including protectors) from the MDF to the cable vault at each end of the span.
- (d) Two 50-pair units between offices.
- (e) 50 repeaters (two apparatus cases) at each repeater location and 50 regenerators in a single direction in each apparatus case.

5. INTERBAY CABLING

5.01 Shown in CD Fig. 2 is a typical interbay cabling arrangement when a DSX1-C bay is provided for centralized patching, cross-connection, monitoring, and fault location.

5.02 TIC interbay cabling arrangements provide:

- (a) Compatibility for arrangements with or without DSX1-C bays.
- (b) Maximum interbay cabling distances.
- (c) Maintain test set compatibility at all jack interfaces.
- (d) Minimize within-unit signal level variations.
- (e) No significant flat loss mismatch in transmitted signal levels.

5.03 Although the DSX1-C bay is not required, it provides maximum flexibility for repeater bay to repeater bay and MIC to repeater bay separations of up to 800 feet. An additional 20 feet of cabling may be used for cross-connection between DSX1-C bays. When a DSX1-C bay is provided, no

jack appearances except order-wire tel-set jacks are permitted on the office repeater bay. The DSX1-C is engineered as a common level point for all TIC signals.

5.04 The office repeater and MIC output signals are 2.4-dB hotter than the equivalent line repeater output and are preequalized in their respective bays to provide a 6-volt peak-to-peak signal at the cross-connect interface.

5.05 Three codes of equalizers in 0.8-dB steps are provided to maintain signal level difference due to equalization to ± 0.4 dB. The output power of the office repeater is adjusted to ± 0.25 dB and the within-unit signal level difference at the transmitting side output will be ± 0.65 dB.

5.06 When no DSX1-C is provided and jack appearances remain on the repeater bay, the equalizers will be engineered as if there were a DSX1-C located within the bay itself. That is, the equalizer code for 0- to 135-foot cross-connect distances would be used for every repeater in the bay, regardless of the distance to the bay to which the cross-connection was made. This arrangement minimizes flat loss mismatch when systems are looped and provides test set compatibility at the jacks on both bays.

6. SYSTEM DIAGRAMS

6.01 The following information notes represent the most commonly used arrangements:

- (a) **Note 301** - Powering one- or two-cable system power loops.
- (b) **Note 302** - 220B looping repeaters in a one- or two-cable system powered from the other end.
- (c) **Note 303** - Power options over one- or two-cable systems.
- (d) **Note 304** - Spare and bridging repeater cross-connectors for applying signal to the spare line from a working system.
- (e) **Note 305** - Spare line repeater cross-connection at the DSX-1C for a through system at an intermediate office.
- (f) **Note 306** - Spare and bridging repeater cross-connections at the DSX-1C for applying signal to spare line from working system or QRSS.

7. CABLING DIAGRAMS

7.01 The following cabling diagrams are required to connect the office repeater bay to the main distributing frame; to the MIC multiplexer; to the DSX-1C, and to the T-carrier administration system on an optional basis.

(a) CAD 1 and 2 - These figures provide the cabling information for connecting incoming and outgoing line signals at the distributing terminal strip to the repeater shelves.

(b) CAD 3 and 4 - These figures show connections from the main distributing frame to the distributing terminal strip.

(c) CAD 5 - This figure provides connecting information to the DSX-1C when required.

(d) CAD 6 - This figure shows connections to TCAS as required on an optional basis.

(e) CAD 7 - This figure provides connecting information from the bay cross-connect to the M1C multiplexer.

(f) CAD 8 - This figure provides cabling information from a repeater bay to another repeater bay not in the same bay lineup.

(g) CAD 10 and 11 - These figures show the cabling information for connecting the fault locating lines to the repeater bay from the MDF to the fault locate line jack circuit.

3.04 Provides order wire circuits with service alarm connections to permit conversation and signaling between line repeater location, terminal, and intermediate offices during installation, lineup, and maintenance operations.

3.05 Provides alarm circuits for detecting fuse failures within the plug-in repeaters and bay powering circuit. Also provided are loop or ground closures to operate the office audible and visual alarms.

3.06 Provides shop-wired connectors to accept up to eight regulator power dissipation circuits which are used in conjunction with the regulating repeaters.

3.07 Provides power and fusing circuitry to distribute the voltages needed to power the office repeaters and span lines.

3.08 Provides for fault locating office repeaters by including jacks, and connectors for as many as four plug-in fault locating filters.

3.09 Provides order wire circuits.

3.10 Provides cross-connect facilities to permit cross-connections to be made at either terminal or intermediate offices.

3.11 Provides a complete section of powering notes that cover the rules for designing power loops.

3.12 Provides information figures covering typical powering arrangements.

3.13 Provides test set power jacks for powering test sets from -48 volt battery.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 The maximum cross-connect distance between office repeater bays is 135 feet.

1.02 The maximum cross-connect distance between the office repeater bay and the M1C is 400 feet.

1.03 The maximum cross-connect distance between the office repeater bay and the DSX-1C is 400 feet.

1.04 The nominal loss between the office repeater bay and the first manhole repeater is 32 dB at 1.576 MHz (4000 feet with 22-gauge cable). The minimum loss is 4 dB.

1.05 Maximum ambient temperature extremes over which the office repeaters will operate are 0 to +140 degrees F.

2. FUNCTIONAL DESIGNATIONS

2.01 None.

3. FUNCTIONS

3.01 Provides for transmission on a one- or two-cable basis.

3.02 The M1C may be used as the terminals of the TIC digital system.

3.03 Provides jacks as access points for test equipment and spare line patching.

4. CONNECTING CIRCUITS

4.01 M1C Multiplexer - SD-1C599-01

4.02 Line Repeater Type 218 or 219 - SD-3C205-01

4.03 Office Repeater - 220 Type - SD-3C253-01

4.04 The following are typical connecting circuits:

(a) ESS - No. 1 - Office Alarm Circuit - SD-1A158-01

(b) ESS - No. 1 - Remote Master Scanner - Applique Circuit - SD-1A210-01

(c) No. 5 - Alarm Circuit - SD-25671-01

(d) SXS - No. 1 or 350A - Audible Alarm Circuit - SD-31551-02

(e) SXS - No. 350A - Pilot Lamp and - Power Alarm Lamp Circuits - SD-31573-01

(f) SXS - No. 356A - Alarm Circuit -
SD-32145-01

(g) Annunciator Circuit - SD-90202-01

(h) Audible Alarm and - Pilot Lamp
Circuit - SD-90614-01

(i) Voice-frequency Alarm and - Order
Wire Signaling Circuit - SD-95143-01

(j) Audible and Visual Alarm Circuit -
SD-96188-01, SD-95063-01, and SD-95075-01

5. MANUFACTURING TESTING REQUIREMENTS

5.01 There are no manufacturing testing requirements for this circuit.

SECTION IV - REASONS FOR REISSUE

CHANGES

D. Description of Changes

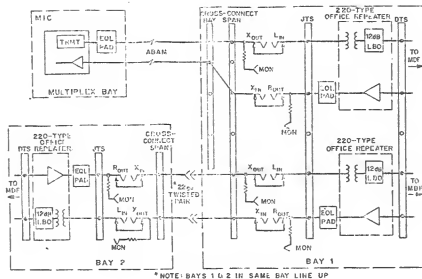
D.1 Since no product has been manufactured, no record of changes is being kept.

BELL TELEPHONE LABORATORIES, INCORPORATED

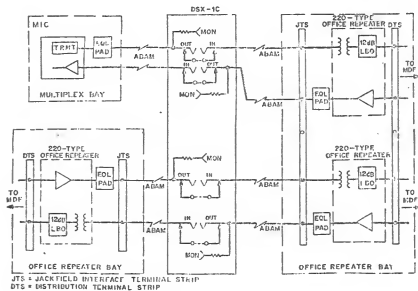
DEPT 4323-WAJ-JBS

Attachments

CD Fig. 1 and 2



CD Fig. 1 - Typical T1C Intraoffice Cabling Arrangement



CD Fig. 2 - Typical T1C Interbay Cabling Arrangement

